Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

16-AMRP-0108

FEB 2 6 2016

Mr. S. M. Sax, President
Washington Closure Hanford LLC
Richland, Washington 99354

Dear Mr. Sax:

CONTRACT NO. DE-AC06-05RL14655 – ENVIRONMENTAL RESTORATION DISPOSAL FACILITY (ERDF) DEBRIS TREATMENT PLAN, WCH-546, JANUARY 2016, REVISION 1

Attached for your use is the signed subject document. If you have any questions, please contact me, or your staff may contact Owen Robertson, of the River Corridor Closure Project, at (509) 373-6295.

Sincerely,

Jenise C Connerly

Jenise C. Connerly
Contracting Officer

AMRP:OCR

Attachment

cc w/attach:
W. A. Borlaug, WCH
D. R. Einan, EPA
D.L. Plung, WCH
Administrative Record, H6-08 (ERDF)

WCH-546
Rev. 1

River Corridor
Closure Contract

Environmental Restoration Disposal Facility Debris Treatment Plan

January 2016

For Public Release

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor

WCH-546
Rev. 1

DOE-RL AND/OR REGULATOR APPROVAL PAGE

Title: Environmental Restoration Disposal Facility Debris Treatment Plan

Approval: M. S. French
U.S. Department of Energy, Richland Operations Office

M. S. French
Signature

2/2/16
Date

D. R. Einan
U.S. Environmental Protection Agency

Signature

10 Feb 16
Date

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STANDARD APPROVAL PAGE

Title: Environmental Restoration Disposal Facility Debris Treatment Plan

Author Name: M. A. Casbon, Waste Operations

Approval: R. T. Hynes, Waste Services

Signature _____ Date 1/13/16

W. A. Borlaug, Waste Operations

Signature _____ Date 1/13/2016

The approval signatures on this page indicate that this document has been authorized for information release to the public through appropriate channels. No other forms or signatures are required to document this information release.

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1.0 INTRODUCTION

Construction and operation of the Environmental Restoration Disposal Facility (ERDF) was authorized by the *Record of Decision for the Environmental Restoration Disposal Facility* (EPA 1995). The ERDF is authorized to perform debris treatment at the *U.S. Department of Energy Environmental Restoration Disposal Facility, Hanford Site – 200 Area Benton County, Washington Amended Record of Decision, Decision Summary and Responsiveness Summary* (EPA 1997). Waste streams acceptable for treatment and disposal are updated in the *U.S. Department of Energy Environmental Restoration Disposal Facility Hanford Site – 200 Area Benton County, Washington Amended Record of Decision, Decision Summary and Responsiveness Summary* (EPA 2007).

Hazardous and/or low-level mixed waste debris is generated from various activities on the Hanford Site. *Resource Conservation and Recovery Act of 1976* (RCRA), 40 CFR 268.2(g), "Land Disposal Restrictions," defines debris as solid material exceeding a 60 mm particle size that is intended for disposal and that is a manufactured object, plant or animal matter, or natural geologic material. However, the following materials are not debris: any material for which a specific treatment standard is provided in 40 CFR 268 Subpart D, such as lead acid batteries, cadmium batteries, and radioactive lead solids.

In accordance with regulatory requirements, treatment of hazardous debris waste streams is required to meet land disposal restrictions (LDRs) identified in 40 CFR 268 and WAC 173-303-140, "Land Disposal Restrictions," prior to disposal at the ERDF. Debris waste received at ERDF requiring treatment must meet the acceptance requirements in accordance with the *Environmental Restoration Disposal Facility Waste Acceptance Criteria* (WCH-191). Waste streams that meet the definition of hazardous debris may be treated using the alternative treatment standard for hazardous debris, which includes, but is not limited to, immobilization technologies (i.e., macroencapsulation, microencapsulation, and sealing).

2.0 PURPOSE

The purpose of this treatment plan is to describe the immobilization treatment methods used at ERDF to meet 40 CFR 268 LDR requirements. The treatment plan describes the processes for macroencapsulation, microencapsulation, and sealing of hazardous/dangerous debris at ERDF as defined in 40 CFR 268.45, "Treatment Standard for Hazardous Debris."

3.0 SCOPE

The scope of this treatment plan covers LDR debris requiring treatment prior to disposal in the ERDF landfill. 40 CFR 268.2 (g) defines debris as:

> "...solid material exceeding a 60 mm particle size that is intended for disposal and that is: A manufactured object; or plant or animal matter; or natural

> geologic material. However, the following materials are not debris: Any material for which a specific treatment standard is provided in Subpart D, 40 CFR Part 268, namely lead acid batteries, cadmium batteries and radioactive lead solids; process residuals such as smelter slag and residues from the treatment of waste, wastewater, sludges, or air emission residues; and intact containers of hazardous waste that are not ruptured and that retain at least seventy-five percent of their original volume. A mixture of debris that has not been treated to the standards provided by 40 CFR 268.45 and other material is subject to regulation as debris if the mixture is comprised primarily of debris, by volume, based on visual inspection."

Alternative treatment standards technology descriptions for hazardous debris are outlined in 40 CFR 268.45, Table 1. If a waste stream meets the debris definition, it may be treated using a technology-based treatment standard. The ERDF will employ the immobilization technology treatment standards for hazardous debris, which allows macroencapsulation, microencapsulation, and sealing.

Radioactive lead solids (RLSs) are another type of hazardous waste that requires treatment. The RLS is a regulatory subcategory of the waste code D008 and is subject to the treatment standards in 40 CFR 268.40 identified as technology code MACRO. The RLSs include, but are not limited to, all forms of lead shielding and other elemental forms of lead that are potentially contaminated with radioactive material. There are no size criteria for RLS, unlike the 60-mm particle size requirement for hazardous debris. As such, all forms of RLS, including lead shot or fine lead particles, require macroencapsulation prior to disposal. At the Hanford Site most elemental lead encountered will be RLS, and lead solids should be considered to be so unless specific information about the lead solids indicates otherwise. The RLS must be treated using MACRO technology that is described in 40 CFR 268.42, Table 1. The MACRO treatment method is described as "Macroencapsulation with surface coating materials such as polymeric organics (e.g., resins and plastics) or with a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media." Macroencapsulation specifically does not include any material that would be classified as a tank or container according to 40 CFR 260.10. Therefore, RLS may not be treated using microencapsulation. Treatment of RLS may take place either inside or outside of the trench depending on whether or not the waste item containing the RLS meets the criteria for in-trench treatment as described in Section 4.0 with the appropriate regulatory approval as described in Section 6.0 below.

4.0 IN-TRENCH TREATMENT CRITERIA

The 2015 Amendment to the ERDF Record of Decision (EPA 2015) allows long, large, and/or heavy hazardous (LLHH) waste items to be macroencapsulated inside the ERDF trench using cementitious grout. This treatment method may only be used on waste items that have the following characteristics:

1. Items that are too big to fit in and be treated within a standard 15.3-m^3 (20-yd^3) ERDF container (i.e., more than 6 m [19 ft] long, more than 2 m [7 ft] wide, and/or more than 1 m [3 ft] tall) and too hazardous to be safely size reduced; and are

2. Items with radiological contamination that would result in direct worker exposure during the macroencapsulation conducted prior to placement in ERDF and could result in airborne

radioactivity if an industrial accident caused the waste item packaging to breach or the item to break (potentially releasing internal contamination) during treatment or transport activities; and/or are items with non-uniform weight distributions that present issues with rigging, crane lifts, etc., that contribute to the potential for industrial accidents that could increase the number of severe worker injuries and radiological exposures.

Hazardous debris not having these characteristics must be treated outside of the ERDF trench. RLS must be an integral part of an LLHH waste item in order to be treated in the ERDF trench.

5.0 TREATMENT PLAN

5.1 WASTE STREAM DESCRIPTIONS

Hazardous debris is generated from various cleanup activities on the Hanford Site. Treatment of these waste streams is required to meet LDR identified in 40 CFR 268 prior to disposal at ERDF. Waste streams that conform to the 40 CFR 268.2(h) definition of debris may be immobilized at ERDF using macroencapsulation, microencapsulation, or sealing technology methods.

5.2 ALTERNATIVE TREATMENT STANDARDS

Alternative treatment standards for hazardous debris are provided in 40 CFR 268.45, Table 1. The purpose of this treatment plan is to establish acceptable immobilization technologies that will be utilized at ERDF. The immobilization technology descriptions include macroencapsulation, microencapsulation, and sealing. The methods may be combined to form a composite treatment with U.S. Environmental Protection Agency (EPA) permission.

5.2.1 Macroencapsulation with Polymeric Organics

This technology requires application of surface-coating materials manufactured with polymeric organics to jacket the debris and substantially reduce the surface exposure to potential leaching media.

5.2.2 Macroencapsulation with Inorganic Materials

Instead of using polymeric organics to jacket the debris material, the material is encased in a jacket of inert inorganic materials (e.g., Portland cement grout/concrete) to substantially reduce the surface exposure to potential leaching media.

5.2.3 Microencapsulation with Inorganic Materials

This treatment is stabilization of the debris with Portland cement and/or lime/pozzolans to reduce the leachability of the hazardous contaminants on the debris.

5.2.4 Sealing

This treatment is application of an organic sealant (e.g., epoxy, silicone, or urethane compounds) that adheres tightly to the debris surface to avoid exposure of the surface to potential leaching media.

5.3 IMMOBILIZATION METHODS

The treatment standards described above will utilize the methodologies described below.

5.3.1 Polyurea/Polyurethane Resin Coating (Macroencapsulation)

Application of surface coating materials such as polymeric organics (e.g., resins and plastics such as polyurea/polyurethane) to waste items or containerized waste will fully encapsulate the waste. The coating will be allowed to cure and dry prior to being transferred into the disposal trench. Lifting and loading will be conducted with care to ensure the resin-coated waste will not be damaged during transfer into the disposal cell. Independent visual inspection of all resin-coated waste will be conducted prior to disposal to ensure complete encapsulation. Polyurea coatings directly applied to the waste (as opposed to the waste's container) meet the criteria of MACRO for RLS.

5.3.2 Grout/Cement (Macroencapsulation)

Containers in which waste is macroencapsulated shall be lined with inert (e.g., metal or plastic) offsets that prevent the waste from contacting the container. Waste items that do not meet the criteria for in-trench treatment will be placed in a container to be macroencapsulated in grout outside of the trench. Offsets will allow the grout/cement to fully surround the waste to macroencapsulate it. The grout/cement will also fill any voids within the waste matrix and the container so that the macroencapsulated container will have less than 10% void and will be acceptable for disposal. Grout/cement macroencapsulation as described here also meets the criteria for MACRO for RLS.

5.3.3 Macroencapsulation in the ERDF Trench

LLHH waste items meeting the criteria listed in Section 4.0 may be macroencapsulated in the ERDF trench. The LLHH waste items will be directly placed on concrete blocks, pads, or inorganic standoffs to allow the free flow of grout to completely surround and cover the waste items. This will take place at a location in the trench that has been prepared for receipt, treatment, and disposal of the item. Composite macroencapsulation is not acceptable for in-trench macroencapsulation. Once placed, the spread of contamination from the waste item will be prevented by protecting it from rain, snow, or wind through the use of tarps, berms, ditches, and/or appropriate packaging (e.g., IP-1 bag) prior to encapsulation. If any contamination escapes from the item's packaging, it will be trapped, collected, treated, and disposed of in accordance with applicable requirements. Encapsulation will be accomplished by flood grouting with single or multiple pours (depending on the overall size/shape of the LLHH waste items). Grout/cement macroencapsulation as described here also meets the criteria for MACRO of RLS associated with LLHH waste items.

5.3.4 Grout/Cement Microencapsulation

Portland cement-based grout will be used for microencapsulation of the hazardous debris in containers outside of the trench. A flowable grout that will sustain loads of at least 140 lb/in^2 when cured will be used to surround the hazardous debris waste without needing offsets between the waste and the container. The hazardous debris waste shall not be greater than 30% soils or other non-debris material (by observation). Microencapsulation shall not be used to treat RLS or any debris containing RLS.

5.3.5 High-Density Polyethylene Packaging for Macroencapsulation

The high-density polyethylene (HDPE) packages (e.g., HDPE tubes, HDPE container shells) are acceptable as an encapsulation coating. All joints or closure caps must be sealed using polyurethane, epoxy, silicone, welded HDPE, or mechanically tightened so the package does not open. Void space within the package will be filled to ensure the packaged waste has less than 10% void space. The filled package must be able to sustain compression loads of at least 140 lb/in^2. This method shall not be used for RLS.

Independent visual inspection of all sealed joints and/or caps will be conducted to ensure encapsulation is complete.

5.3.6 Sealed Polyethylene Liners for Macroencapsulation

Metal boxes with liners constructed of multi-layer materials include polyethylene and protective geomembrane-felt layers will encapsulate the waste placed in the container. An exterior jacket (e.g., a metal box) may be necessary. The HDPE inner liner must be sealed using an EPA-approved closure mechanism. Void space within the box or liner will be filled to ensure the packaged waste has less than 10% void space. The filled package must be able to sustain compression loads of at least 140 lb/in^2. The liner will be verified as sealed and without any ruptures prior to closure of the box. This method shall not be used for RLS.

Transfer of the encapsulated containers will be done in a manner to minimize cracking and preserve the integrity of the macroencapsulation.

5.3.7 Sealing

Sealing requires application of an appropriate material (e.g., polyurethane, epoxy, silicone) that adheres tightly to the debris surface to avoid exposure of the surface to potential leaching media. Paint may not be used as a sealant. When necessary to seal the surface effectively, sealing entails pretreatment of the debris surface to remove foreign matter and to clean and roughen the surface. Directly applied sealing meets the criteria for MACRO of RLS.

Sealing must avoid exposure of the debris surface to potential leaching media, and sealant must be resistant to degradation by the debris and its contaminants and materials into which it may come into contact after placement (leachate, other waste, microbes).

6.0 REGULATORY APPROVAL FOR TREATMENT OF DEBRIS

The generator of the waste to be treated at ERDF shall obtain written approval from the generator's lead regulatory agency for use of the applicable treatment methodologies as described in this treatment plan. *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) decision documents or the approval to treat form (Appendix A) are to be used to document the regulator's approval. Treatment of waste described in EPA (2007), Table 1 will be subject to authorization by the ERDF lead regulator. Authorization for treatment of waste covered by the EPA (2007) plug-in approach shall also be by the ERDF lead regulator. Certain waste streams have very few waste items per waste profile. These may be approved as a group that encompasses multiple waste profiles with approval of the regulator.

An approval to treat form (Appendix A) may be used to document regulatory approval of the applicable treatment methodologies. It will identify the waste profile(s) and identify the treatment method(s) applicable to the waste.

Treatment of LLHH RCRA hazardous debris in the ERDF trench is limited to wastes described in EPA (2007), Table 1. LLHH RCRA or CERCLA hazardous debris waste items in storage that do not appear in that table may be authorized by EPA for in-trench treatment at ERDF using the plug-in approach described in EPA (2007).

7.0 TREATMENT OPERATION

- Work control procedures/work packages, radiological work permits, and job hazard analysis for specific immobilization methods will be utilized.
- Personnel will be trained and qualified to perform immobilization treatment for each method.
- The treatment process area will be posted and have barriers as specified in the work control procedures and work packages.
- During the treatment process, observations of potential spills of waste or leakage of fluids from contact with the waste will be monitored.
- Liners or sheeting (e.g., visqueen, poly sheeting) shall be placed in the treatment processing area to prevent spread of contamination from spills or leakage during the treatment process. A concrete pad or adequate packaging (e.g., IP-1 bag) for spill containment may be utilized of liners or sheeting.
- Any contamination that escapes from the item's packaging will be trapped, collected, and treated.
- Spill control kits will be available in the treatment process area.

7.1 OUT-OF-TRENCH TREATMENT

- Waste items that do not meet the criteria for in-trench treatment will be treated using one of the methods described in Section 5.3 other than macroencapsulation in the trench (Section 5.3.2).

- The treated waste will be transferred into the disposal trench in a manner that will not compromise the immobilization treatment.

7.2 IN-TRENCH TREATMENT

- A location in the trench will be prepared for receipt and disposal of the item. Preparation includes placement of plastic sheeting or concrete pad to capture any contamination that may escape from the LLHH waste item (if adequate packaging [e.g., IP-1 bag] is not utilized), placement of inorganic standoffs to support the waste item (if a concrete pad is not utilized), and construction of a berm or forms to contain the grout. Berms or form construction may be completed shortly after the waste item is placed on the standoffs or concrete pad.

- The spread of contamination from the waste item will be prevented through the use of tarps, berms, ditches, and/or adequate packaging prior to encapsulation. Waste items that are too large to be covered in grout in a single pour will be protected from precipitation between pours.

- If possible, LLHH waste items will be treated in a single pour. Multiple pours may be necessary for large items.

- Grout shall be allowed to cure a sufficient degree to withstand the forces generated by covering the treated waste with clean or waste soil prior to burial.

7.3 AIR MONITORING

Air monitoring during the treatment processes will be performed in accordance with WCH-190, *Air Monitoring Plan for the Environmental Restoration Disposal Facility*.

8.0 REFERENCES

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, as amended.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, et seq.

EPA, 1995, *Record of Decision for the Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington*, EPA/ROD/R10-95/100, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 1997, *U.S. Department of Energy Environmental Restoration Disposal Facility, Hanford Site – 200 Area Benton County, Washington Amended Record of Decision, Decision Summary and Responsiveness Summary*, EPA/AMD/R10-97/101, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2007, *U.S. Department of Energy Environmental Restoration Disposal Facility Hanford Site – 200 Area Benton County, Washington Amended Record of Decision, Decision Summary and Responsiveness Summary*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2015, *U.S. Department of Energy Environmental Restoration Disposal Facility Hanford Site – 200 Area Benton County, Washington Amended Record of Decision, Decision Summary and Responsiveness Summary*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq., as amended.

WAC 173-303-140, "Land Disposal Restrictions," *Washington Administrative Code,* as amended.

WCH-190, 2009, *Air Monitoring Plan for the Environmental Restoration Disposal Facility,* current revision, Washington Closure Hanford, Richland, Washington.

WCH-191, 2015, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, current revision, Washington Closure Hanford, Richland, Washington.

APPENDIX A

APPROVAL TO TREAT DOCUMENT

APPENDIX A

APPROVAL TO TREAT DOCUMENT

APPROVAL TO TREAT (APTT)

Waste Profile*: WP-

This Approval to Treat authorizes ERDF to treat hazardous debris described in the referenced profile(s) by immobilization technologies as described in WCH-546, *ERDF Debris Treatment Plan*.

The following hazardous debris immobilization technologies, as described in Section 5.3 of WCH-546, are approved for this waste stream (insert all that are applicable):

Lead Regulatory Agency Name (Print and Sign) — Date

Check applicable agency: ☐ U.S. Environmental Protection Agency

☐ Department of Ecology, Washington

U.S. Department of Energy Name (Print and Sign) — Date

*List additional profiles below.

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